

**EKG2000 SERVICE MANUAL**

**- TABLE OF CONTENTS -**

- 1. EKG-2000 configuration**
  - (1) Basic components**
  - (2) Optional components**
  - (3) Exploded view**
  
- 2. Circuit analysis**
  
  
- 3. Disassembly and assembly**
  
  
  
- 4. Adjustment**
  - (1) Adjustment of the EKG wave volume**
  - (2) Adjustment of the LCD brightness**
  
  
  
- 5. TROUBLE SHOOTING**
  
  
  
- 6. Circuit drawing**
  
  
  
- 7. List of the part**

**1.EKG-2000 configuration****(1) Basic components**

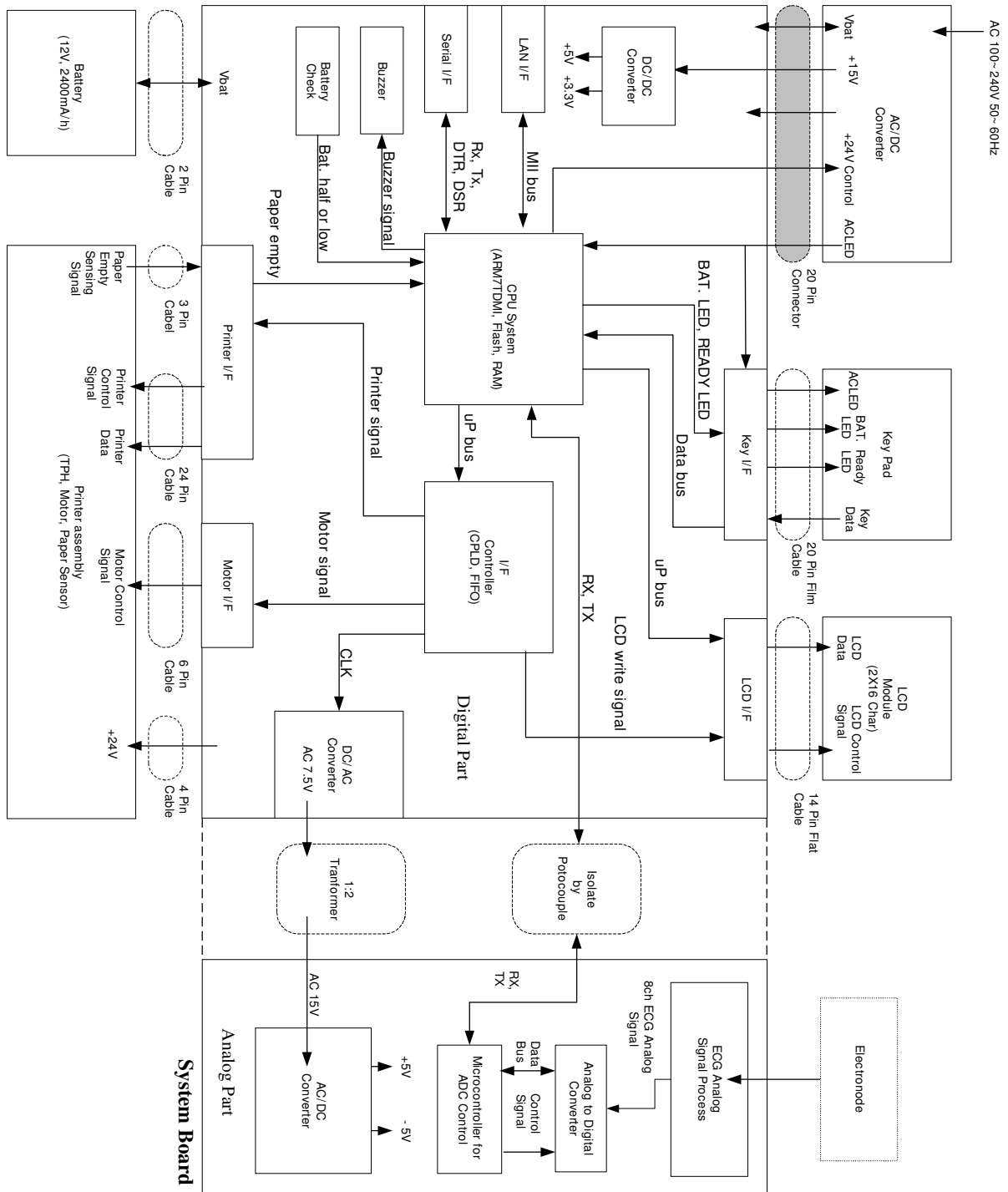
●EKG2000 MAIN BODY	1 SET
●PAPER (NO GRID,GRID)	1 EA
●CHEST SENSOR	1 SET
●LIMB SENSOR	1 SET
●PATIENT CABLE	1 EA
●POWER CODE	1 EA
●110V / 220V 변환 ADAPTER	1 EA

**(2) Optional components**

●SERIAL CABLE	1 EA
●NULL CABLE	1 EA
●BATTERY	1 EA
●FAX MODEM	1 EA

**(3) Exploded view****2. Circuit analysis**

TCF of the EKG2000 Hardware



## System Board

It is mainly divided into a digital part and an analogue part.

The digital part consists of ARM7TDMI, Memory, Interface Controller, DC/DC Converter, Buzzer, Battery Check, DC/AC Controller and chip, which are linked to other external modules.

Whereas, the analogue part consists of (1) an electrocardiogram analogue part where receives bio signals (2) and an analogue-to-digital converter which changes the analogue signals into the digital signals (3) and micro-controller which controls the ADC (Analogue-to-Digital Converter) and sends the coming signals to the digital part. Also, it is divided into power and signal, in order to produce the minimum effect by electrical noise, despite sitting on the system board same as the digital part.

## **AC/DC Converter**

It receives 100-240V AC, 50-60Hz signal or battery and supplies 15V and 24V to the system board.

## **Key Pad**

It is linked to the system board with a 20-pin film cable and consists of a 14 key, AC LED, battery LED, ready LED.

The AC LED will light up if the equipment approves AC power.

The Battery LED will always light up if the equipment is switched on and it indicates how much battery has been recharged. The green LED will light up if the battery is satisfactory. Whereas, the red LED will light up if the battery is run out shortly.

The Ready LED will light up if the electrocardiogram signal is stably detected.

## **LCD Module**

It has 2 rows and 16 columns in a characterized LCD and is linked to the system board with a 14-pin flat cable.

## **Printer assembly**

It consists of the TPH (Thermal Printer Head), motor, and paper sensor. And it is linked to the system board with 3-pin, 4-pin, 6-pin, and 24-pin cable and approves 24V AC power which will be approved only if the printer assembly is working.

## **Battery**

It is linked to the system board with a 2-pin cable. It is 12V, 2400mA/h and consists of

twenty 1.2V, 1200mA/h NiMH battery. It is packed in parallel with 2 sets which are are connected with 10 cells in series

**3.Disassembly and assembly(refer to ‘Directions of the work’)**

#### **4. Adjustment**

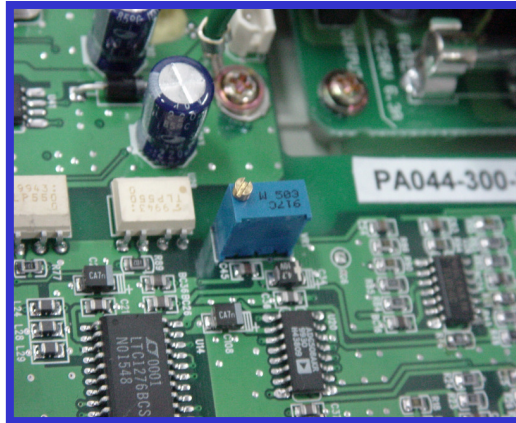
##### **(1) Adjustment of the EKG wave volume**

Set printer speed of EKG-2000 to 25mm/sec and EKG signal volume to 10mm/mV. Connect the EKG cable to a simulator, and then set a heart rate to 60, and a wave volume to 1mV. And turn VR1 clockwise to make the wave volume 8mm while

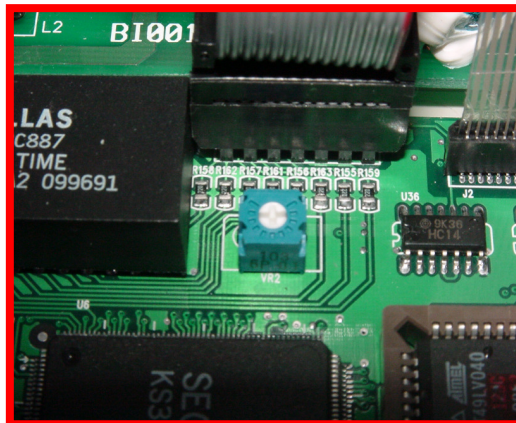
outputting through a monitor

**(2) Adjustment of the LCD brightness.**

To make the letters on the LCD screen clear, set the brightness by turning VR2 clockwise.



VR part to adjust the volume of the EKG wave

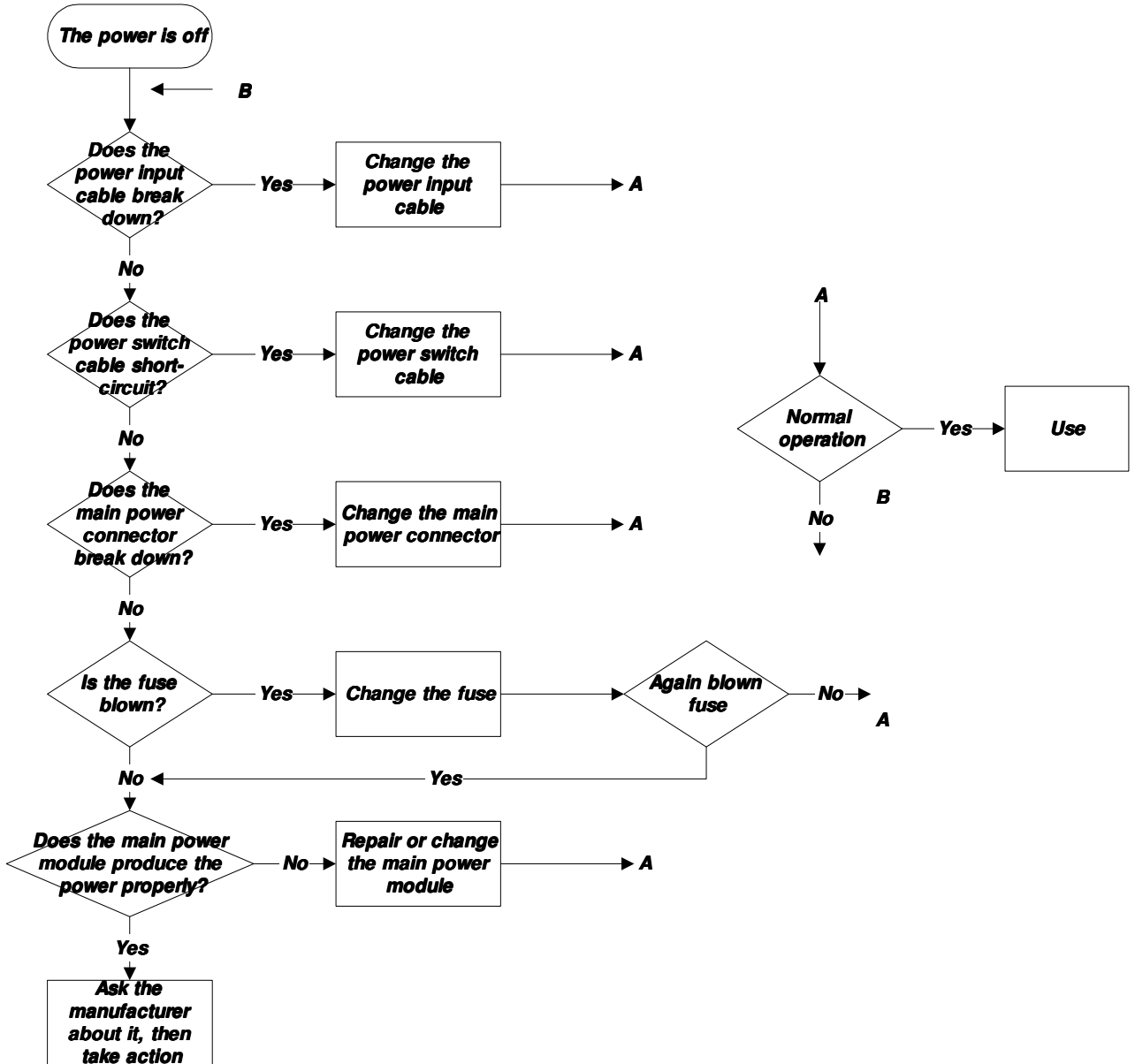


VR part to adjust the brightness of the LCD

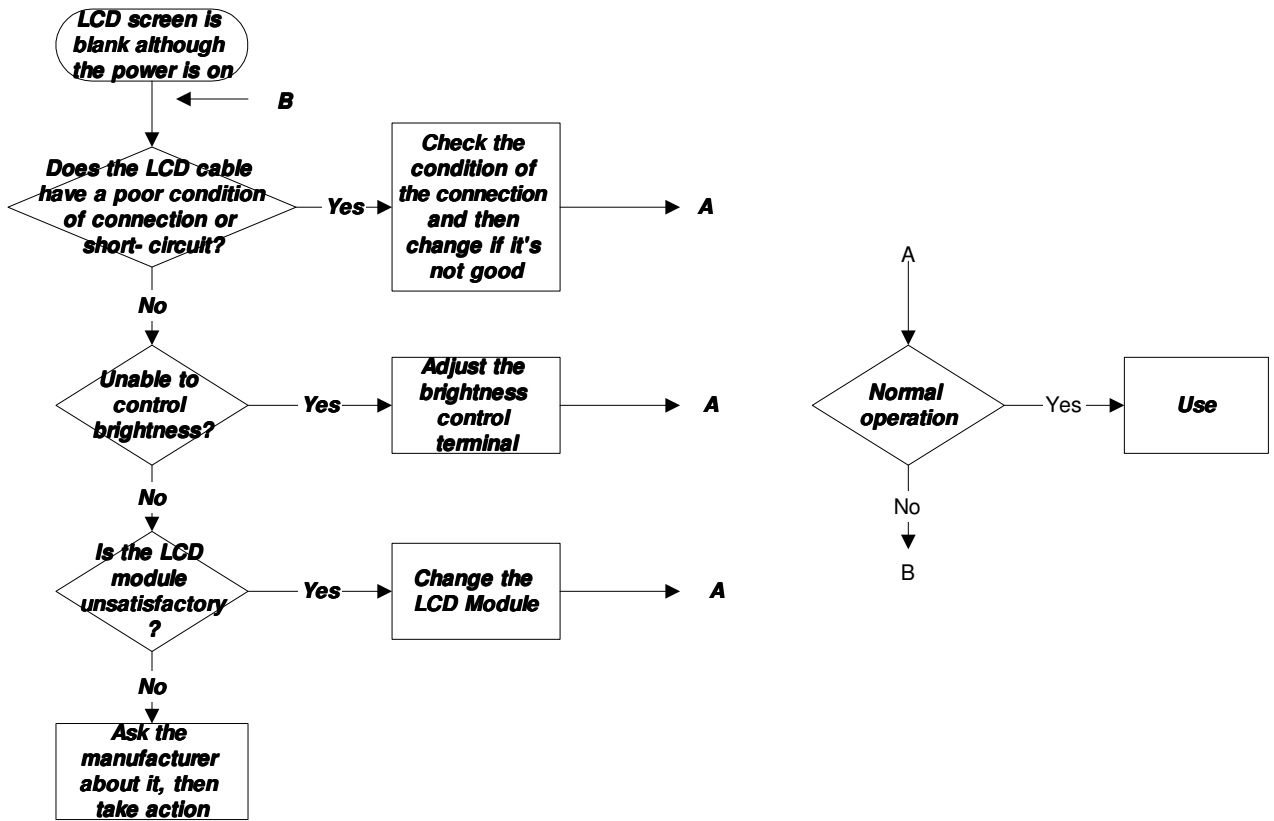
**5. TROUBLE SHOOTING**



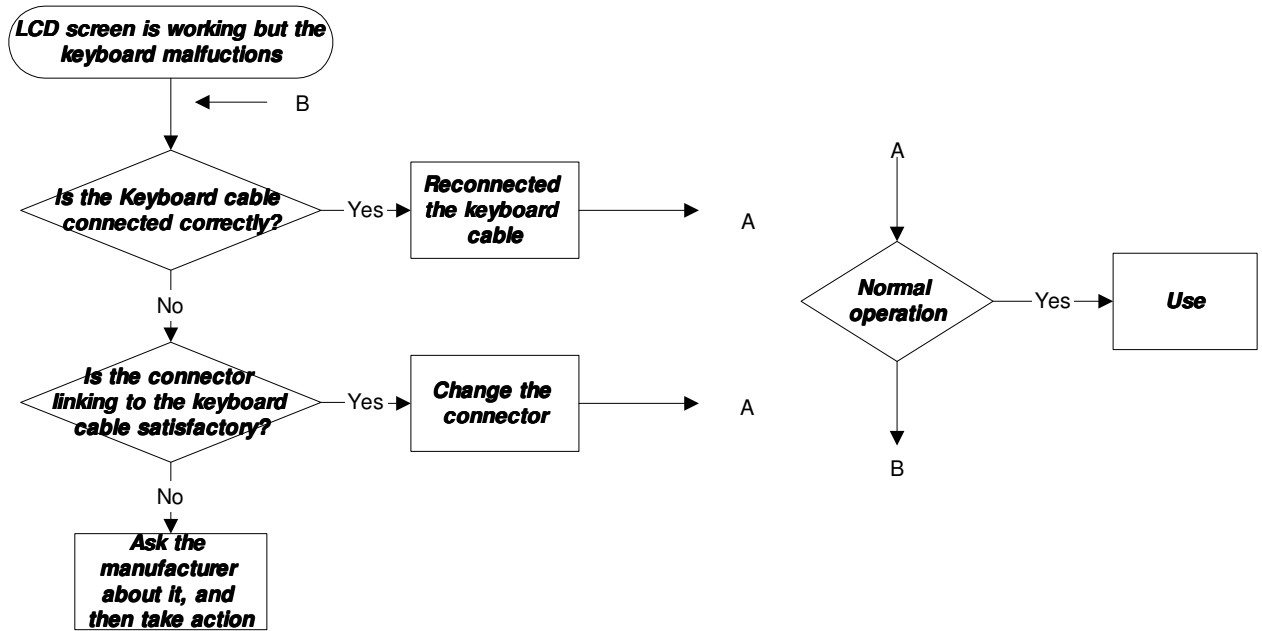
# 1. The power is off



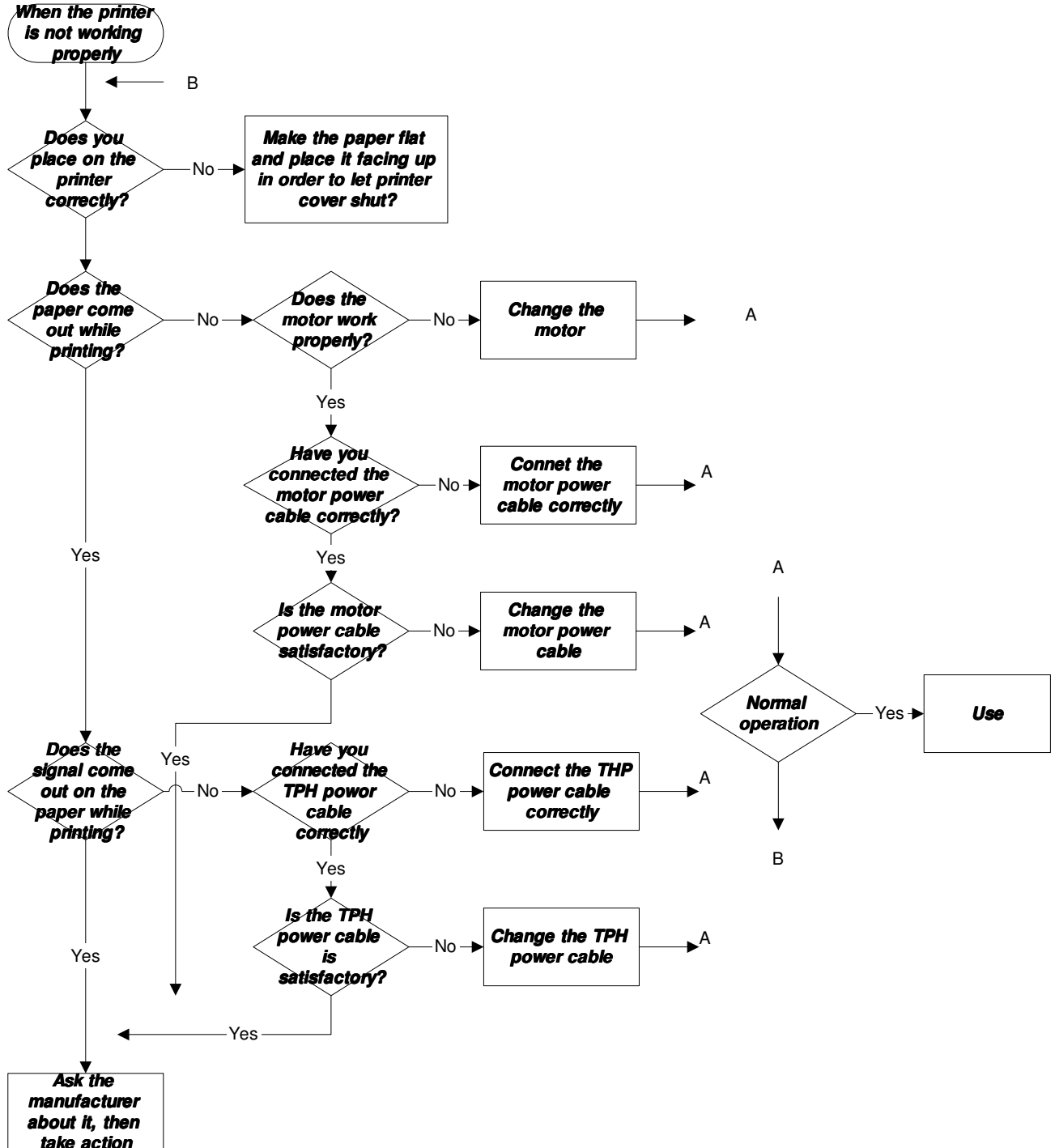
#2. LCD screen is blank although the power is on



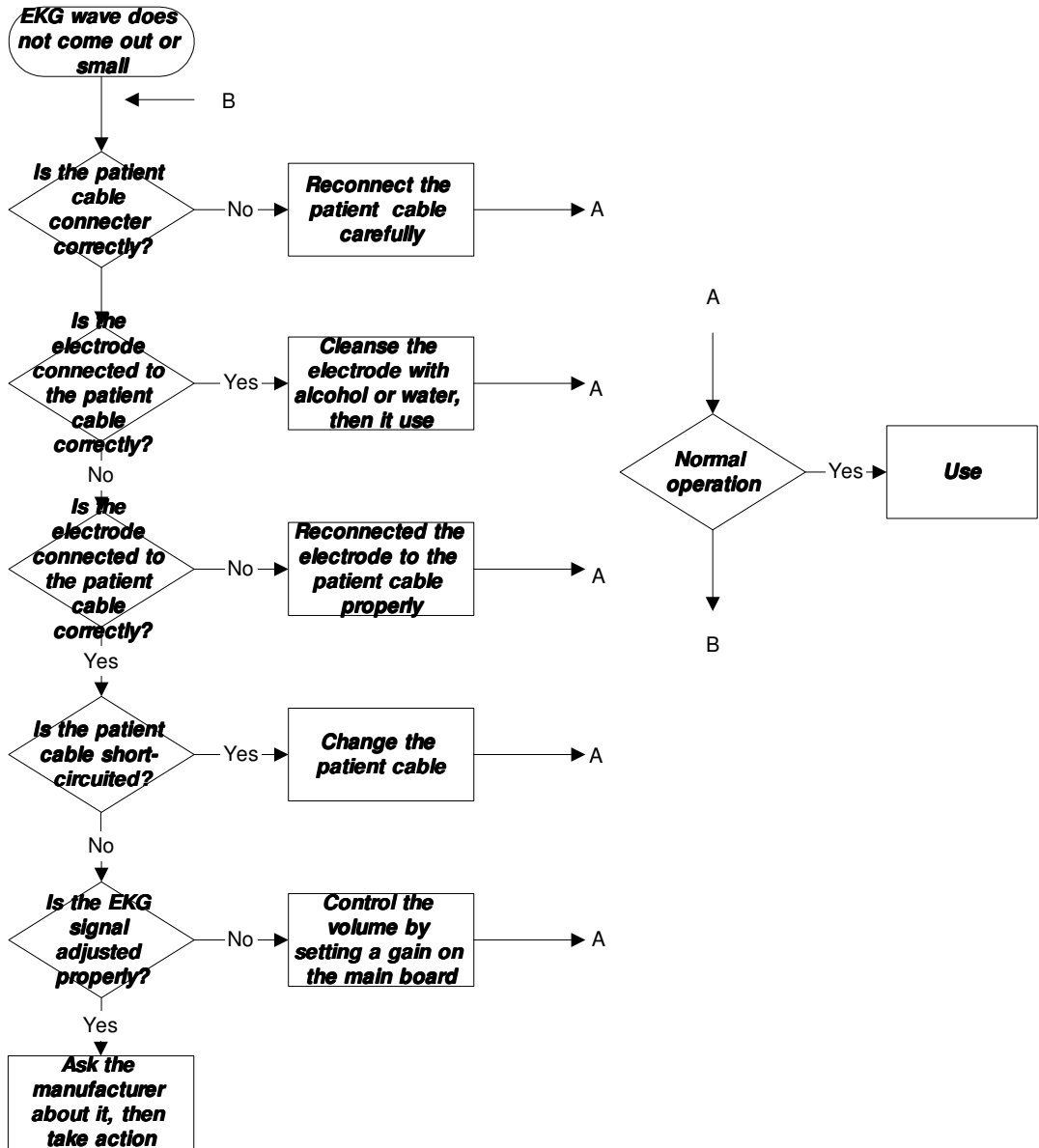
**# 3. Malfunction of the keyboard**



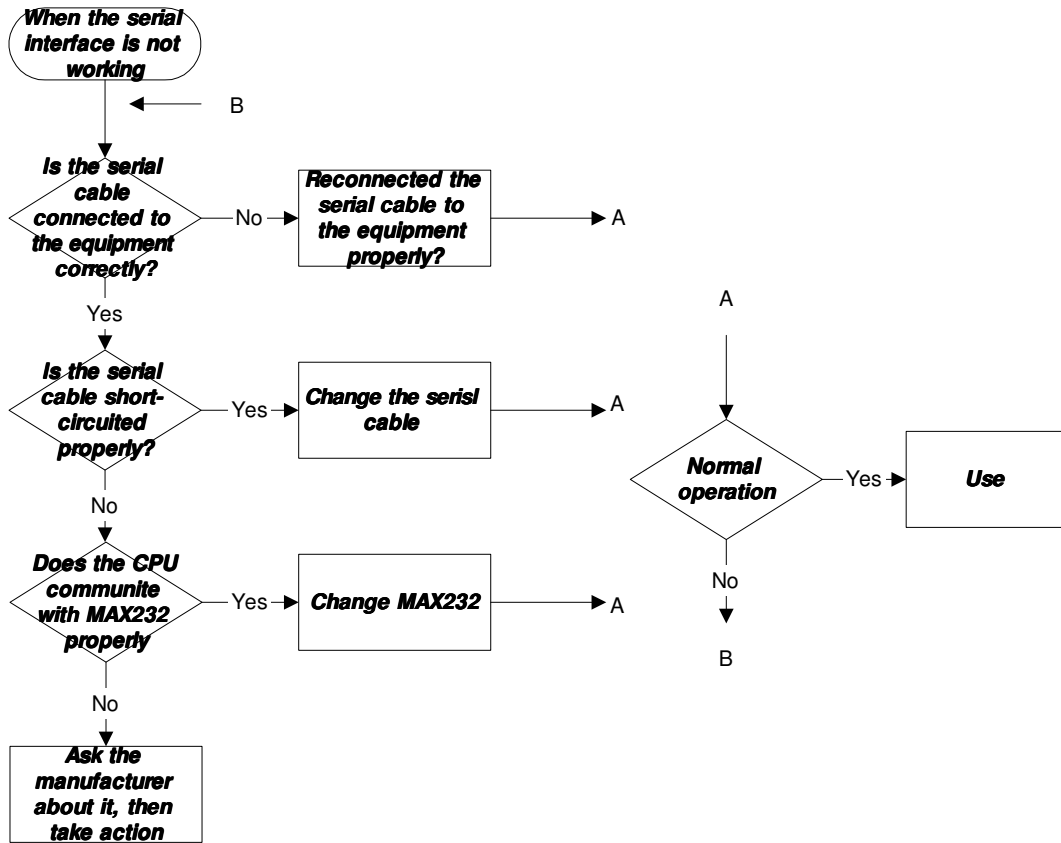
# 4. When the printer is not working properly



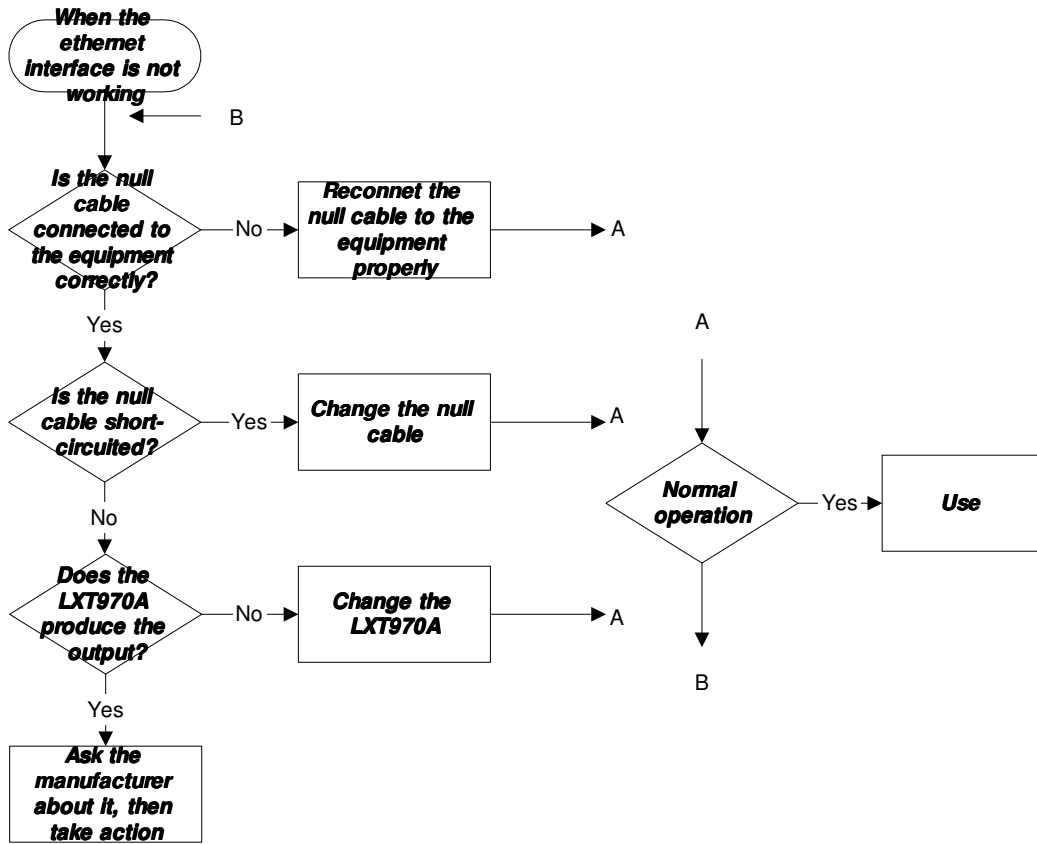
#5. EKG wave does not come out or it's very small



# 6. When the serial interface is not working

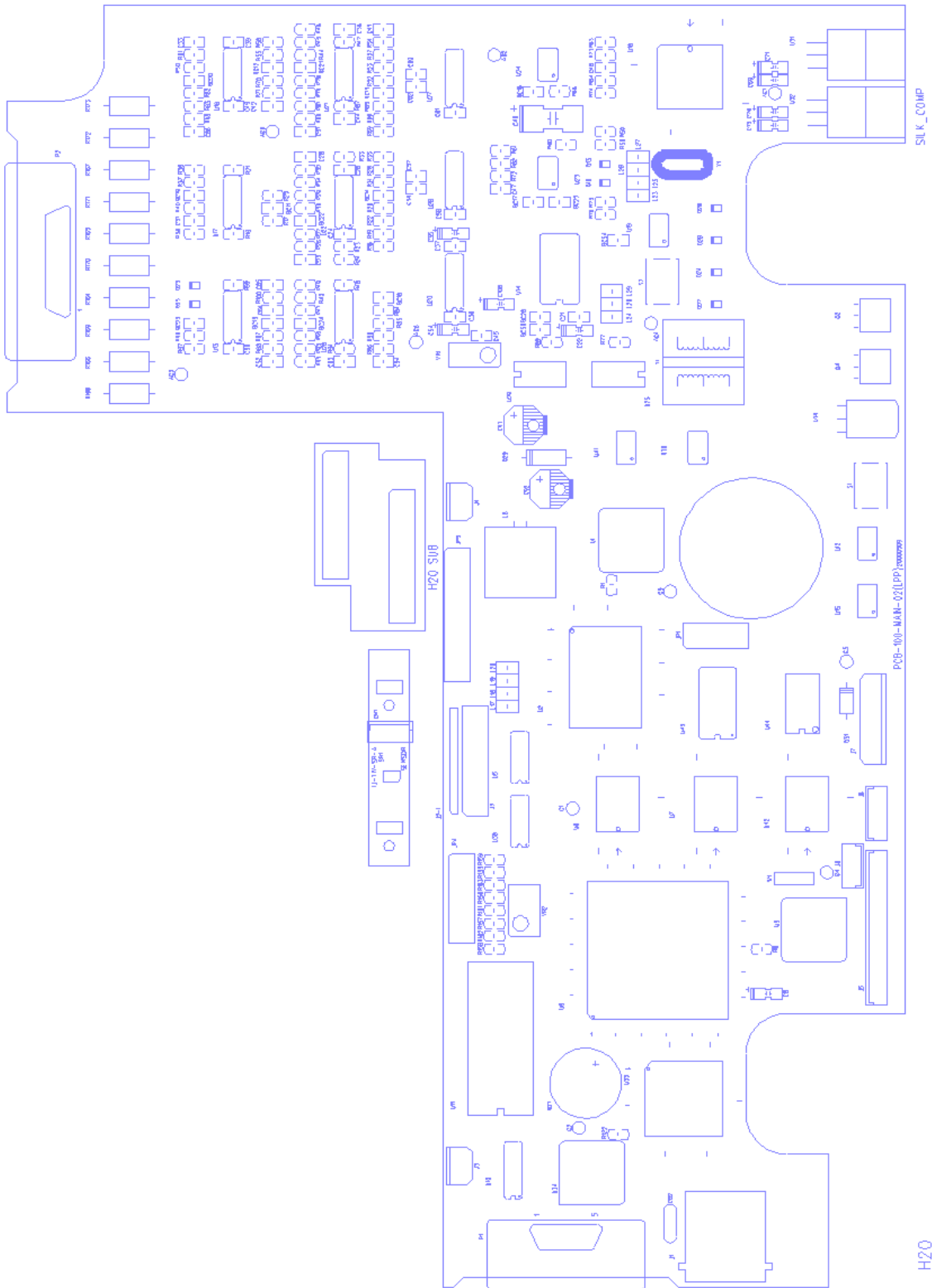


**#7. When the ethernet interface is not working**



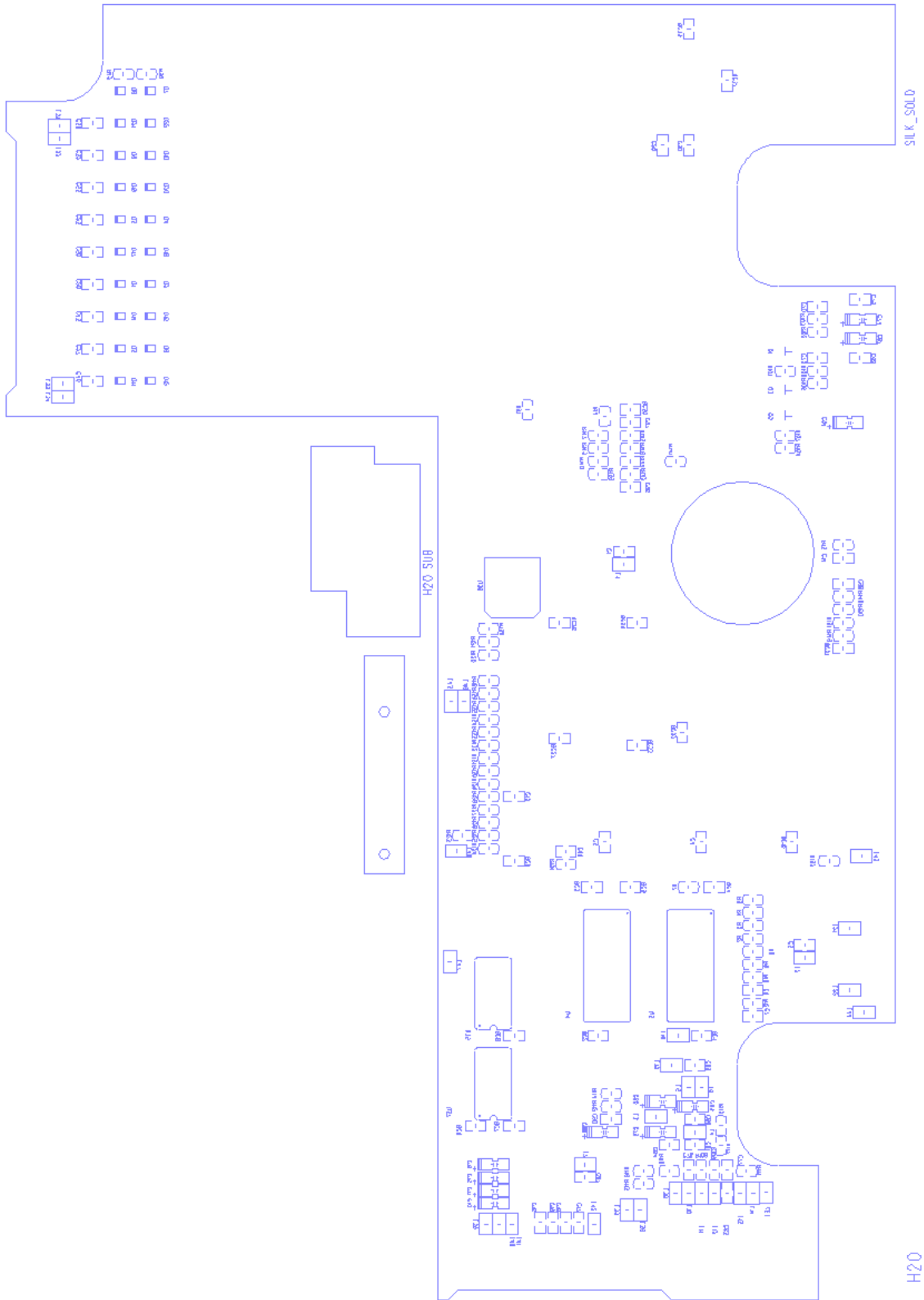
6. Circuit drawing

(1) Top view



(2)Bottom view





7. List of the part

CLASSIFICATION	DISCRIPTION	LOCATION NUMBER
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BEAD	BEAD	L1,L2,L3,L4,L5,L6,L7,L10,L11,L12,L13,L14,L15,L16 L17,L18,L19,L20,L21,L22,L23,L24,L25,L26,L27,L28 L29,L31,L32,L33,L34,L35,L36,L37,L38,L39,L40,L41 L42,L43,L44,L45,L46,L47,L48
IC	LM7805	U31
	LM7905	U32
	DS12C887	U11
	TLP550	U25,U29
	74HC14	U5,U36
	74HC245	U35,U37,U43
	AT49LV040	U7,U8
	89C52	U16
	DG212	U27,U28
	DG508	U20
	DS1232LPS-2	U12,U19
	ATF1508	U2
	IDT7201	U42
	KM416S4030	U3,U4
	KS32C50100	U6
	LM2903	U41
	LM25765-5	U38
	LM358	U15,U23,U24
	LT1086-3.3	U39
	LTC1276	U14
	LXT970A	U33
MAX232	U10	
TL064	U13,U17,U18,U21,U22,U26	
TL431	D30	
ULN2064	U44	
CAPACITOR(CERAMIC)	DIP 0.001UF	C82
CAPACITOR(ELECT)	DIP 100 UF	C92
	DIP 220 UF	C93
CONNECTOR	FILM20PIN	J2
	HEADER 5*2	JP1
	HEADER 7*2	JP4
	HEADER 10*1	JP5
	HEADER 1*3	W1
CAPACITOR(CERAMIC)	0.1 UF	BC1,BC2,BC3,BC4,BC5,BC6,BC7,BC8,BC9,BC10 BC11,BC12,BC13,BC14,BC15,BC16,BC17,BC18,BC19 BC20,BC21,BC22,BC23,BC24,BC25,BC26,BC27,BC28 BC29,BC30,BC31,BC32,BC33,BC34,BC35,BC36,BC37 C1,C4,C5,C13,C14,C21,C31,C36,C37,C48,C57,C58 C59,C60,C61,C62,C66,C68,C70,C73,C75,C77,C78,C83
CLASSIFICATION	DISCRIPTION	LOCATION NUMBER
CAPACITOR(CERAMIC)	0.1 UF	C84,C86,C87,C89,C90,C96,C97,C98,C99
	0.01 UF	C9,C47,C65

	15 PF	C29,C30
	2200 PF	C25,C28,C38,CD41,C44,C51,C54,C63
	330 PF	C16,C17,C18,C19
	390 PF	C20,C23,C27,C32,C40,C43,C50,C53,C56,C64
	0.47 UF	C24,C26,C33,C39,C42,C45,C49,C52,C55
	820 PF	C7
CAPACITOR(TANTAL)	0.1 UF	C10,C11,C12,C15
	10 UF	C8,C22,C67,C69,C71,C72,C74,C76,C79,C80,C85,C88 C94,C108
	47 UF	C46
	4.7 UF	C34,C35
DIODE	1N5819	D29
	1N5258	D31
	BZV55-C2V4	D7,D8,D23,D25
	1N4148	D1,D2,D3,D4,D5,D6,D9,D10,D11,D12,D13,D14,D15,D16 D17,D18,D19,D20,D21,D22,D24,D26,D27,D28
CHOEK COIL	100uH 1A	L8
OSILATOR	4MHz	U1
	11.0592MHz	U9
	25MHz	U34
X-TAL	22.1284MHz	Y1
BUZZER	BUZZER	BZ1
RESISTER(DIP)	10K 1/2W	R164,R165,R166,R167,R168,R169,R170,R171,R172,R173
RESISTER(SMD)	0	R140
	10	R105,R103
	100	R111,R99
	1K	R60,R89,R101,R107,R112,R118,R120,R121
	10K 1%	R39,R42,R98,R100,R146,R147
	10K	R12,R13,R14,R49,R63,R68,,R73,R74,R113,R115,R116 R117,R141,R142,R143,,R154
	12K	R150
	130K	R62
	22	R1,R2,R3,R4,R5,R6,R8,R122,R155,R156,R157,R158 R159,R161,R162,R163
	2K	R114
	20K 1%	R18,R19,R20,R22,R27,R28,R31,R33,R34,R35,R40,R48 R57,R69,R81,R90,R95
	20K	R41,R43
	22K 1%	R110
	51K 1%	R17,R25,R37,R51,R56,R71,R83,R88,R97
	330	R138,R77
	3K	R61
CLASSIFICATION	DISCRIPTION	LOCATION NUMBER
RESISTER(SMD)	30K	R148
	3M	R23,R24,,R29,R30,R44,R45,R52,R53,R65,R66,R78,R,79 R84,R85,R92,R93

	360K	R58,R75
	390 1%	R139
	39K 1%	R145,R144
	430K	R72
	47	R91
	470 5%	R102,R106
	4.7K	R7,R9,R10,R123,R124,R125,R126,R127,R128,R129,R130 R131,R132,R133,R134,R135,R136
	47K	R151
	43K	R64
	470K 1%	R26,R32,R47,R54,R67,R80,R86,R94
	49.9 1%	R108,R109
	5.1K 1%	R16,R21,R36,R38,R50,R55,R70,R82,R87,R96
	5.1K	R146,R46
	560 5%	R152
	820K	R59,R76
SWITCH	TACT SW	S1,S2
TRANS	CORE 150	T1
IFT	IFT 020	Q4
	IFT 9120	Q2
TRANSISTOR	2N3904	Q1,Q5
	2N3906	Q3
VR	10K	VR2
	100K	VR1